2020/2021
SPRING SEMESTER
EE304 - Project Progress Report

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OBJECTIVE OF THE PROJECT

In the project, we aimed to design a sensor system that is used in greenhouses to provide management for temperature, humidity, and light of the greenhouse. This sensor system helps to control temperature, humidity, and light level in the greenhouse. According to inputs coming from sensors, several systems such as heater, vent, and lights are managed.

THE DESIGN

The system includes three different sensors which are a temperature sensor, heat sensor, and light sensor. These three sensors are connected with the MCU to provide parameters as input. According to levels of temperature, humidity, and light, the system activates or deactivates different modules such as a heater, sprinkler, light, and vent. The design can be seen in Figure 1. Additionally, Figure 2 shows the sensors and control modules that will be used for the implementation of the project.
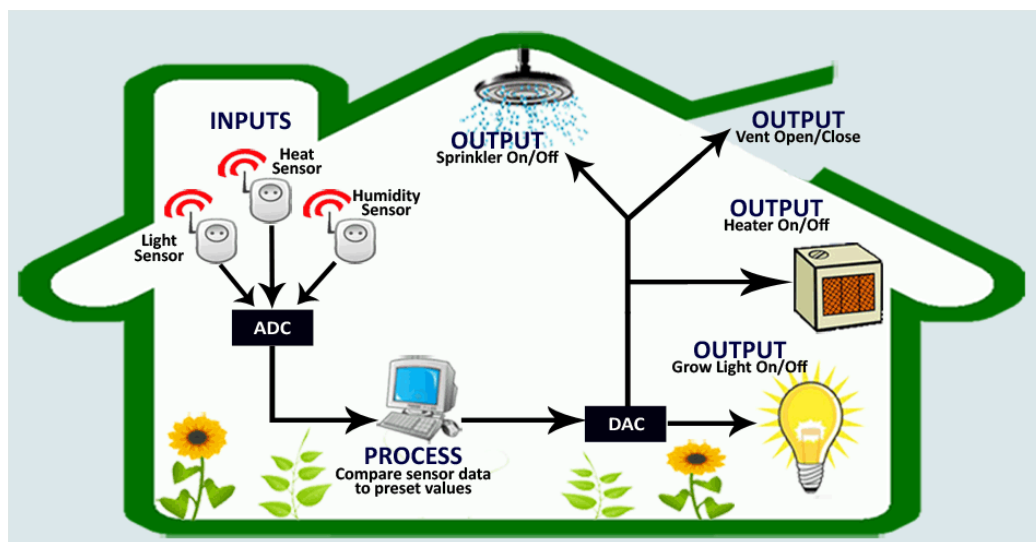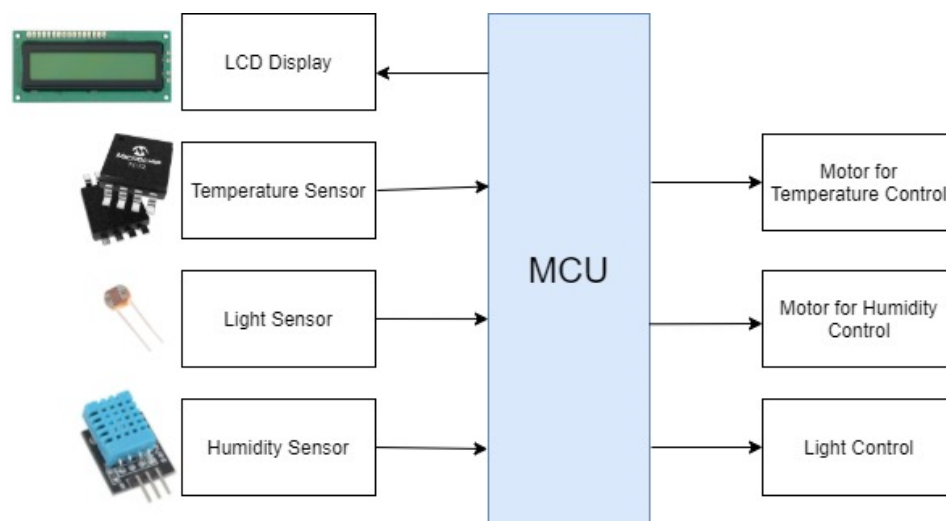

Figure 1. *The design of the system*

Figure 2. *The design of the system for implementation*

FEATURES OF THE SYSTEM

The system has several features depending on different sensors. The temperature system controls the temperature of the greenhouse. If the temperature is low, the system turns on the cooler. If it is high, the system turns off the cooler and turns on the heater. The humidity sensor controls the humidity level of the greenhouse. If the humidity level is low, it turns on the sprinkler. The light sensor controls the light level in the greenhouse. If there is not enough light for fruits and vegetables, the system turns on the lights. A virtual terminal or LCD display shows the levels read from sensors.

THE PRICE OF THE ITEMS

STM32F103C6 MCU - 44,42₺

TC72 Microchip Temperature Sensor - changes between 8₺ and 14₺.

DHT11 Temperature and Humidity Sensor - changes between 8₺ and 10₺.

LDR Light Sensor - 5,58₺

Resistors - 50₺ for 100pcs

LEDs - 55,88₺ for 100pcs

LIST OF TOOLS AND FEATURES

The list of the used tools and features so far:
1) GPIO
    a) Digital input/output
2) Communication
    a) USART/UART
    b) SPI
    c) Using multiple devices at the same time
3) Timers
    a) Output Compare
4) Sensors
    a) Temperature sensor
    b) Humidity sensor
5) Displays

DESIGN STEPS

Up to the present, we worked on the design of the module of the temperature sensor. The TC72 sensor was used to obtain temperature. SPI communication and UART communication is implemented in this module. The current temperature was displayed on the visual terminal and was obtained to control the motor of the heater. After, implementation of the TC72 temperature sensor, we started to work on the design of the module of the humidity sensor. The DHT11 sensor was used to obtain humidity levels.

The list of the implemented design steps so far:
1) Implementation of TC72 sensor:
    a) Implementation of SPI communication between the sensor and the MCU to read the temperature value from the sensor

b) Implementation of UART communication to display the temperature value on virtual terminal
2) Implementation of DHT11 sensor:
    a) Implementation of timers to control the humidity level continuously
    b) Implementation of UART communication
3) Implementation LCD display to display the temperature value.

The list of the following design steps:
1) Implementation of LDR light sensor
2) Implementation of a control module for temperature
3) Implementation of a control module for humidity
4) Implementation of a control module for light

CHALLENGES

One of the challenges that we faced during the implementation part is about reading the value from the humidity sensor. We faced an error while obtaining value and we have not yet to overcome this challenge.

SCREENSHOT
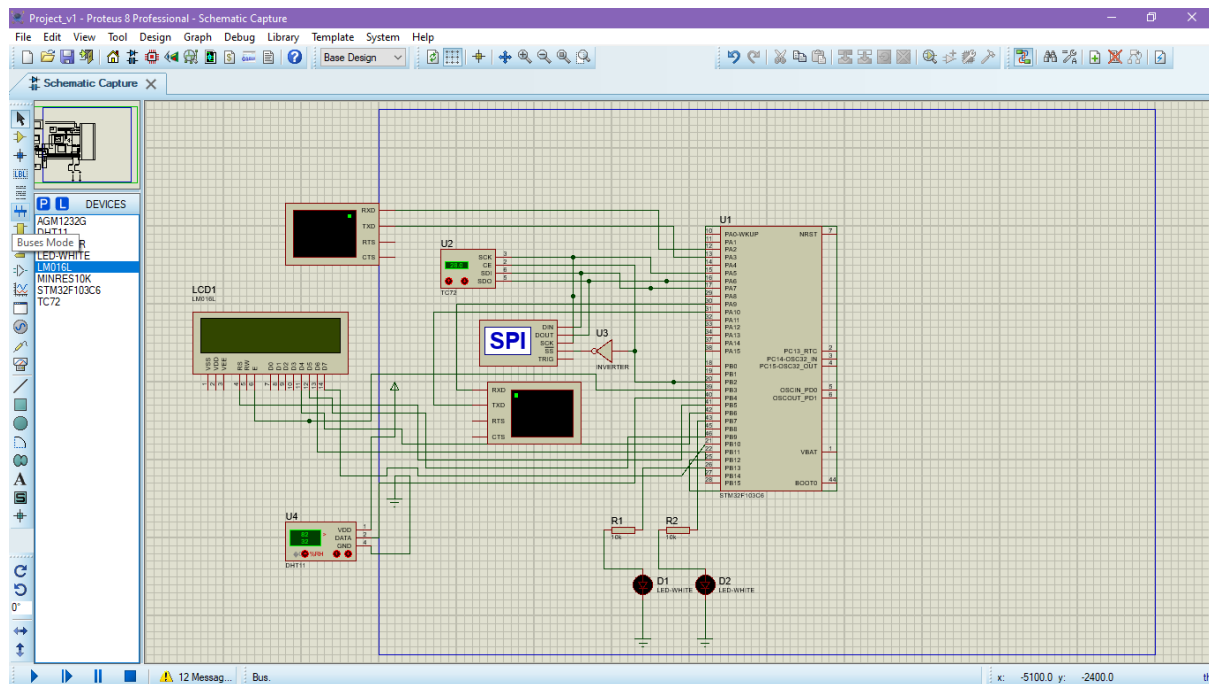
LINK OF THE VIDEO

https://drive.google.com/drive/folders/1EGoJI4R3RFTdduw4g2YOW9TYj9X7smUx?usp=sharing